



ENVIRONMENTAL CONSIDERATIONS IN THE OHIO RIVER MAINSTEM SYSTEM STUDY

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- **Need to address cumulative effects**
- **Consider resource and ecosystem sustainability**
- **Recognize water resources plan and environmental impact uncertainties**
- **Incorporate adaptive management (monitoring, feedback, and adjustment)**



- **Inland waterway navigation system - second busiest in nation**
- **981 miles; 19 lock and dam projects**
- **Economic studies - navigation traffic scenarios, investment strategies via ORNIM, and review and adjustment of SIP**
- **Engineering studies - risk functions for repair and rehabilitation of facilities and equipment, sizes of locks, and review and adjustment of risk functions**
- **Environmental studies - CEA study, PEIS, and review and adjustment of environmental sustainability measures**



CUMULATIVE IMPACTS

The impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. CIs can result from individually minor but collectively significant actions taking place over a period of time. (40 CFR §1508.7)



ENVIRONMENTAL CONTEXT

- **Environmental Operating Principles**
 - **Strive to achieve environmental sustainability**
 - **Seek ways and means to assess and mitigate cumulative impacts**
- **PEIS - address CEs, protect resources and ecosystems, enhance ES, incorporate adaptive management, include site-specific tiering**

ELEMENTS: AEM PROGRAM



- **Information on historical and current conditions of key indicators, and on impacting actions**
- **Scientifically-designed monitoring program**
- **Strategic framework including evaluation and decision-making**
- **Collaborative long-term agreements and steering committee**
- **Budgetary and personnel resources**
- **Peer group of advisors**

CEA STUDY



- **Step 1 - identify significant CEs issues**
 - typical navigation impacts
 - public scoping meetings
 - ERT and 12 VECs
- **Step 2 - establish geographic scope**
 - mainstem and 500-year floodplain
 - exceptions
- **Step 3 - establish time frame**
 - 1920 to 2060
 - data availability



- **Step 4 - identify past, present, and RFFAs**
 - RFFA matrices
 - 87 types of actions
- **Step 5 - characterize VECs**
 - understand system and response to change
 - capacity to withstand stresses
 - analysis of ES (common effects, indicators, connections, ES determination)
- **Steps 6 and 7 - characterize environmental stresses and historical conditions**
 - regulatory thresholds and guidance
 - trends



- **Step 8 - identify cause-and-effect relationships**
 - **checklists and RFFA matrices**
 - **analysis of ES**
- **Step 9 - determine magnitude and significance of CEs**
 - **qualitative determinations and Steps 6 and 7**
 - **analysis of ES**
- **Step 10 - mitigate CEs**
 - **generic measures**
 - **measures to enhance ES**
 - **connect to SIP scenarios**



- **Step 11 - develop monitoring and adaptive management**
 - **focus on not sustainable and marginally sustainable VECs**
 - **collaborative planning**



CEs, ES, WATER QUALITY

- **Identify common effects from high and medium importance actions in RFFA matrix**
- **Select and describe indicators of ES**
- **Connect common effects with indicators**
- **Define ES - not sustainable, marginally sustainable, and sustainable**
- **Characterize ES and delineate mitigation, monitoring and adaptive management as appropriate**

EFFECTS AND EXAMPLES



- **8 actions - turbidity and sedimentation**
 - channel dredging and disposal
 - instream sand and gravel mining
- **5 actions - point source pollution**
 - coal and related industries
 - marina operations
- **4 actions -- nonpoint source pollution**
 - stormwater discharges
 - agriculture
- **8 actions - pollution reduction**
 - more stringent quality standards
 - pollutant source control

INDICATORS OF ES



- **First Tier (scientific measures)**
 - measures of key parameters (DO, FC, T and TSS, N and P)
 - conformance with standards
- **Second Tier (source control)**
 - point and nonpoint source control programs
 - TMDL implementation
 - spill response and monitoring programs
- **Third Tier (composite)**
 - attainment of permissible use designations
 - sustain diverse populations of aquatic organisms

CONNECT/CHARACTERIZE



- **Qualitative discussion of connections between common effects and indicators based on data and analysis**
- **Definitions**
 - **NS - composite conditions not achieving PUDs nor sustaining diverse populations**
 - **MS - marginal achievement**
 - **S - achievement**



- **Characterizations**
 - **1920 to 1950 (NS)**
 - **1950 to now (steady improvement to S)**
 - **future (further improvement of S)**
- **Source monitoring for selected actions as part of AM program**

Improving Ecosystem Sustainability



- **Process**

- 1. Form a working group of regional resource experts**
- 2. Pose questions regarding sustainability to the group**
- 3. Analyze responses and condense into succinct, actionable objectives**
- 4. Prioritize**
- 5. Review and refine**

Ecological Sustainability



- **Constraints**

- 1. System is highly modified and will remain so**
- 2. Focus on ecological processes**
- 3. Don't be concerned with:**
 - Who is responsible
 - Who will implement improvements
 - Who will pay for improvements
 - When it will occur

Ecosystem Sustainability



- **Three basic questions:**
 - 1. What do we want the resources to look like?**
 - 2. What needs to happen to attain this vision?**
 - 3. What are the possible indicators of sustainability?**

FINAL OBSERVATIONS



- **11 steps provide useful framework**
- **Analyses of ES for VECs can trigger AM program**
- **AM can be useful tool for reducing current uncertainties**
- **Connections between SIP, risk functions, CEA, and AM**
- **Tiering from PEIS can use AM results**